

AMENDMENTS TO THE CLAIMS

Claim 1 (Currently Amended): A metal extraction process comprising providing an ore containing a metallic element; reacting chlorine gas with the ore to form a chloride of the metallic element; mixing the chloride of the metallic element in an ionic liquid at a temperature from 0°C to 200°C to form an electrolyte; electrodepositing the metallic element from the electrolyte; and releasing a chlorine gas product from the electrolyte, wherein the chlorine gas reacting with the ore comprises at least a portion of the chlorine gas product; and

the ionic liquid comprises an organic chloride salt.

Claim 2 (Original): The process according to Claim 1, further comprising dehydrating the ore before reacting the chlorine gas with the ore.

Claim 3 (Original): The process according to Claim 1, wherein the chlorine gas is reacted with the ore in a fluidized bed.

Claim 4 (Original): The process according to Claim 1, wherein the chloride of the metallic element is a gas; wherein the process further comprises condensing the gas to form a condensed metal chloride; and

wherein the condensed metal chloride is mixed with the ionic liquid to form the electrolyte.

Claim 5 (Original): The process according to Claim 1, wherein the metallic element is selected from the group consisting of Li, Mg, Al, Ti, Zr and Nd.

Claim 6 (Original): The process according to Claim 1, wherein the metallic element is Al.

Claim 7 (Original): The process according to Claim 1, wherein the ore is bauxite.

Claim 8 (Original): The process according to Claim 1, wherein the ionic liquid comprises 1-butyl-3-methylimidazolium chloride.

Claim 9 (Original): The process according to Claim 1, wherein more than 80% of the chlorine gas reacting with the ore is the chlorine gas product.

Claim 10 (Original): A metal purification process comprising forming an anode from a material containing a metallic element; dissolving the anode in an electrolyte, comprising an ionic liquid containing a chloride of the metallic element, at a temperature of 0°C to 200°C; and electrodepositing the metallic element from the electrolyte on a cathode.

Claim 11 (Original): The process according to Claim 10, wherein the material comprises a metal alloy.

Claim 12 (Original): The process according to Claim 10, wherein the material comprises a metal matrix composite containing refractory particles in a metal matrix including the metallic element.

Claim 13 (Original): The processing according to Claim 12, wherein the refractory particles comprise at least one selected from the group consisting of SiC, Si₃N₄, AlN and Al₂O₃.

Claim 14 (Original): The process according to Claim 12, wherein the metal matrix comprises a metal alloy.

Claim 15 (Original): The process according to Claim 10, further comprising removing an undissolved portion of the anode from the electrolyte.

Claim 16 (Original): The process according to Claim 10, wherein the metallic element is selected from the group consisting of Li, Mg, Al, Ti, Zr and Nd.

Claim 17 (Original): The process according to Claim 10, wherein the metallic element is Al.

Claim 18 (Original): The process according to Claim 10, wherein the ionic liquid further comprises 1-butyl-3-methylimidazolium chloride.

Claim 19 (Original): The process according to Claim 10, wherein the chloride of the metallic element is AlCl₃.

Claim 20 (Original): The process according to Claim 10, further comprising removing impurities from the electrolyte.

Claim 21 (Original): The process according to Claim 10, wherein the cathode comprises the metallic element.

Claim 22 (Original): A metal purification process comprising providing a starting material containing a metallic element; dissolving the metallic element contained in the starting material in an electrolyte comprising an ionic liquid at a temperature from 0°C to 200°C; and electrodepositing the metallic element contained in the electrolyte on a cathode, wherein the ionic liquid comprises 1-butyl-3-methylimidazolium chloride.

Claim 23 (Original): The process according to Claim 22, wherein the starting material comprises a member selected from the group consisting of an ore containing the metallic element, an alloy containing the metallic element, and a composite comprising refractory particles in a metal matrix containing the metallic element.

Claim 24 (Original): The process according to Claim 22, wherein the metallic element is selected from the group consisting of Li, Mg, Al, Ti, Zr and Nd.

Claim 25 (Currently Amended): An electrolysis cell for refining or recycling a metallic element in an anode of the cell, the electrolysis cell comprising a cathode including a porous basket and electrically conductive particles held by the porous basket;

an electrolyte including an ionic liquid containing a chloride of the metallic element and an organic chloride salt; and

a container holding the cathode and the electrolyte.

Claim 26 (Original): The electrolysis cell according to Claim 25, wherein the porous basket comprises a material selected from the group consisting of Al, Cu and stainless steel.

Claim 27 (Original): The electrolysis cell according to Claim 25, wherein the electrically conductive particles comprise an element selected from Al and C.

Claim 28 (Original): The electrolysis cell according to Claim 25, wherein the ionic liquid further comprises 1-butyl-3-methylimidazolium chloride.

Claim 29 (Original): The electrolysis cell according to Claim 25, wherein the chloride of the metallic element comprises AlCl_3 .